DAY, A. G. 1993. Gilia. *In* J. Hickman, ed. The Jepson Manual. Higher plants of California. University of California Press, Berkeley, CA.

GRANT, V. 1959. Natural history of the Phlox family. I. Systematic Botany. Martinus Nijhof, The Hague.

REVEAL, J. L. 1969. New species in *Eriogonum* and *Gilia* from southern Nevada. Bulletin of the Torrey Botanical Club 96:476–484.

——— and E. L. STYER. 1973. Miscellaneous chromosome counts of western American plants, II. Great Basin Naturalist 33:19–25.

(Received 1 Apr 1993; revision accepted 10 Jan 1994)

NOTE

EXTRAFLORAL NECTARIES ON *ARBUTUS MENZIESII* (MADRONE).—John C. Hunter, Section of Plant Biology, University of California, Davis, CA 95616.

From April to July 1993, I made observations on the vegetative buds of *Arbutus menziesii* (Ericaceae) growing at the University of California's Northern California Coast Range Preserve in Mendocino County. During bud burst and the early stages of leaf expansion, these buds appeared to function as extrafloral nectaries. This has not been previously documented for *Arbutus*.

On branches where the apical bud had begun to swell and burst, a droplet of fluid exuded from the tip of the apical and the upper axillary buds. This fluid tasted faintly sweet, and tested positive for reducing sugars (using Benedict's solution). I observed various Coleoptera, Diptera, and Hymenoptera on the buds, the most abundant of which was the ant *Prenolepis imparis* Say.

Inside the buds, the nectar was exuded from the adaxial surface of the bud scales. On this surface, free-hand sections revealed glandular trichomes that may be the source of the nectar. These trichomes were typically 250–600 nm long and consisted of up to two dozen cells arranged into a basal stalk and a wider head. The trichomes, and frequently adjacent epidermal cells, were densely stained with neutral red, as is commonly seen in active nectaries (Kearns and Inouye, Techniques for Pollination Biology, 1993).

On four trees, I monitored 18 apical and 117 axillary buds on 18 marked branches. During the period of bud burst (April–May), all apical buds and 63 of 117 axillary buds exuded nectar. During leaf expansion, the bud scales reflexed, withered, and abscised. Only 3 of the 63 axillary buds that produced nectar gave rise to fully developed shoots; the others abscised during the summer along with the previous year's leaves and bark.

Extrafloral nectaries are often most active during the period of leaf expansion (Darwin, Journal Linnean Society of London 15:398–409, 1876; Tilman, Ecology 59: 686–692, 1978; Curtis and Lersten, American Journal of Botany 61:835–45, 1974). They are suggested to reduce herbivory by attracting ants that deter herbivores (Bentley, Annual Review of Ecology and Systematics 8:407–427, 1977), and experimental evidence supports this interpretation (Oliviera et al., Oecologia 74:228–230, 1987; Koptur, Ecology 65:1787–1793, 1984). The extrafloral nectaries of *Arbutus menziesii* also may serve this function.

I acknowledge the assistance of M. G. Barbour, S. Baum, M. Bennett, D. Gladish, F. Hrusa, and L. Serafini.

(Received 3 Dec 1993; revision accepted 6 Jan 1994)